Docket No. 5699

"IMPROVED STAIN-RESISTANT POLYAMIDE
COMPOSITION AND FIBERS AND
METHOD OF PRODUCTION THEREOF"

I CLAIM:

1. A method of forming an acid dye stain-resistant fiber or fibers comprising combining a masterbatch concentrate with a fiber-forming polyamide and a polymer and forming a fiber or fibers therefrom, said masterbatch concentrate comprising a reagent and a carrier therefor wherein said reagent has the formula:

$$(Q)_a\text{-}R\text{-}Z(SO_3)_b$$

wherein: Q and Z are moieties which associate with free acid dye sites in said polyamide;

a is an integer from 0 to 2;

b is an integer from 1 to 4; and

R is selected from the group consisting of aliphatic, aromatic or alicyclic hydrocarbyl groups; and

said carrier is selected from the group consisting of:

(A) a terpolymer comprising from about 56% to about 94.5% by weight of at least one alpha-monoolefin having 2 to 8 carbon atoms, about 5% to about 40% by weight of an

ethylene-α,ß unsaturated carboxylic acid (1) C_1-C_4 alkyl or (2) glycidyl ester and from about 0.5% to about 4.0% by weight of an internal anhydride of an ethylenically unsaturated carboxylic acid;

(B) a semi-crystalline thermoplastic polyester having a melting point of about 235°C or less;

(C) a semi-crystalline thermoplastic polyamide with a melting point of about 235°C or less; and

(D) mixtures thereof;

and further wherein said polymer is selected from the group consisting of (A) and mixtures of (A) with at least one of (B) and (C) wherein the percentage by weight in said polymer of internal anhydride of an ethylenically unsaturated carboxylic acid is in the range of from about 0.5% to about 4.0%.

2. The method of claim 1 comprising melt-spinning said combination of masterbatch concentrate, fiber-forming polyamide and polymer.

3. The method of claim 2 comprising combining said masterbatch concentrate, said fiber-forming polyamide and said polymer on-line in said melt-spinning process.

4. The method of claim 1 wherein said masterbatch concentrate comprises from about 20% to about 80% by weight of said reagent.

5. The method of claim 1 wherein said combination contains an amount of said masterbatch concentrate that contains between about 1,500 ppm and about 3,000 ppm of sulfur; an amount of said polymer such that the combination contains between about 0.01% to about 0.6% of the internal anhydride; and the remainder is said polyamide.

6. The method of claim 5 wherein at least one of said Q and Z is a carboxylic acid group or a salt thereof.

7. The method of claim 5 wherein at least one of said Q and Z is an isocyanate group.

8. The method of claim 5 wherein at least two of said Q and Z combine to form a carboxylic acid anhydride.

9. The method of claim 5 wherein said reagent is 5-sulfoisophthalic acid or a salt thereof.

10. The method of claim 9 wherein said reagent is an alkali metal, alkaline earth metal or transition metal salt of 5-sulfoisophthalic acid.

11. The method of claim 10 wherein said reagent is the lithium salt of 5-sulfoisophthalic acid.

12. The method of claim 10 wherein said reagent is the sodium salt of 5-sulfoisophthalic acid.

13. The method of claim 10 wherein said reagent is 3-sulfobenzoic acid or the sodium or lithium salt thereof.

14. The method of claim 1 wherein, in (A), said alpha-monoolefin is ethylene.

15. The method of claim 1 wherein, in (A), said ethylene-α,ß unsaturated acid is acrylic acid, methacrylic acid or mixtures thereof.

16. The method of claim 1 wherein, in (A), said internal anhydride of an ethylenically unsaturated acid is maleic anhydride.

17. The method of claim 1 wherein, in (B), said alpha-monoolefin is ethylene.

18. The method of claim 1 wherein said carrier and said polymer may be the same or different.

19. The method of claim 1 wherein said fiber-forming polyamide is PA-6.

20. The method of claim 1 wherein said fiber-forming polyamide is PA-66.

21. The method of claim 1 wherein said fiber-forming polyamide is PA-MXD6.

22. The method of claim 1 wherein said fiber-forming polyamide is PA-11.

23. The method of claim 1 wherein said fiber-forming polyamide is PA-12.

24. The method of claim 1 wherein said fiber-forming polyamide is PA-69.

25. The method of claim 1 wherein said fiber-forming polyamide is PA-610.

26. The method of claim 1 wherein said fiber-forming polyamide is PA-612.

27. The method of claim 1 wherein said fiber-forming polyamide is an amorphous polyamide.

28. The method of claim 27 wherein said fiber-forming amorphous polyamide is a copolymer of terephthalic acid and trimethylhexamethylene diamine.

29. The method of claim 1 wherein said combination additionally contains a fiber-forming adjuvant.

30. The method of claim 29 wherein said fiber-forming adjuvant is an anti-oxidant, stabilizer, colorant, processing aid, catalyst, filler, nucleating agent, anti-microbial, melt viscosity enhancer or mixtures thereof.

31. An acid dye stain-resistant fiber-forming polyamide composition comprising a combination of a masterbatch concentrate, a fiber-forming polyamide and a polymer, said

masterbatch concentrate comprising a reagent and a carrier therefor wherein said reagent has the formula:

$$(Q)_a\text{-}R\text{-}Z(SO_3)_b$$

wherein: Q and Z are moieties which associate with free acid dye sites in said polyamide;

a is an integer from 0 to 2;

b is an integer from 1 to 4; and

R is selected from the group consisting of aliphatic, aromatic or alicyclic hydrocarbyl groups; and

said carrier is selected from the group consisting of:

(A) a terpolymer comprising from about 56% to about 94.5% by weight of at least one alpha-monoolefin having 2 to 8 carbon atoms, about 5% to about 40% by weight of an ethylene-α,ß unsaturated carboxylic acid (1) C_1-C_4 alkyl or (2) glycidyl ester and from about 0.5% to about 4.0% by weight of an internal anhydride of an ethylenically unsaturated carboxylic acid;

(B) a semi-crystalline thermoplastic polyester having a melting point of about 235°C or less;

(C) a semi-crystalline thermoplastic polyamide with a melting point of about 235°C or less; and

(D) mixtures thereof;

and further wherein said polymer is selected from the group consisting of (A) and mixtures of (A) with at least one of (B)

and (C) wherein the percentage by weight in said polymer of internal anhydride of an ethylenically unsaturated carboxylic acid is in the range of from about 0.5% to about 4.0%.

32. The composition of claim 31 wherein said masterbatch concentrate comprises from about 20% to about 80% by weight of said reagent.

33. The composition of claim 31 wherein said combination contains an amount of said masterbatch concentrate that contains between about 1,500 ppm and about 3,000 ppm of sulfur; an amount of said polymer such that the combination contains between about 0.01% to about 0.6% of the internal anhydride; and the remainder is said polyamide.

34. The composition of claim 33 wherein at least one of said Q and Z is a carboxylic acid group or a salt thereof.

35. The composition of claim 33 wherein at least one of said Q and Z is an isocyanate group.

36. The composition of claim 33 wherein at least two of said Q and Z combine to form a carboxylic acid anhydride.

37. The composition of claim 33 wherein said reagent is 5-sulfoisophthalic acid or a salt thereof.

38. The composition of claim 37 wherein said reagent is an alkali metal, alkaline earth metal or transition metal salt of 5-sulfoisophthalic acid.

39. The composition of claim 38 wherein said reagent is the lithium salt of 5-sulfoisophthalic acid.

40. The composition of claim 38 wherein said reagent is the sodium salt of 5-sulfoisophthalic acid.

41. The composition of claim 38 wherein said reagent is 3-sulfobenzoic acid or the sodium or lithium salt thereof.

42. The composition of claim 31 wherein, in (A), said alpha-monoolefin is ethylene.

43. The composition of claim 31 wherein, in (A), said ethylene-α,β unsaturated acid is acrylic acid, methacrylic acid or mixtures thereof.

44. The composition of claim 31 wherein, in (A), said internal anhydride of an ethylenically unsaturated acid is maleic anhydride.

45. The composition of claim 31 wherein, in (B), said alpha-monoolefin is ethylene.

46. The composition of claim 31 wherein said carrier and said polymer may be the same or different.

47. The composition of claim 31 wherein said fiber-forming polyamide is PA-6.

48. The composition of claim 31 wherein said fiber-forming polyamide is PA-66.

49. The composition of claim 31 wherein said fiber-forming polyamide is PA-MXD6.

50. The composition of claim 31 wherein said fiber-forming polyamide is PA-11.

51. The composition of claim 31 wherein said fiber-forming polyamide is PA-12.

52. The composition of claim 31 wherein said fiber-forming polyamide is PA-69.

53. The method of claim 31 wherein said fiber-forming polyamide is PA-610.

54. The method of claim 31 wherein said fiber-forming polyamide is PA-612.

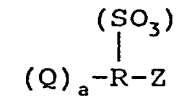
55. The composition of claim 31 wherein said fiber-forming polyamide is an amorphous polyamide.

56. The composition of claim 55 wherein said fiber-forming amorphous polyamide is a copolymer of terephthalic acid and trimethylhexamethylene diamine.

57. The composition of claim 31 wherein said combination additionally contains a fiber-forming adjuvant.

58. The composition of claim 57 wherein said fiber-forming adjuvant is an anti-oxidant, stabilizer, colorant, processing aid, catalyst, filler, nucleating agent, anti-microbial, melt viscosity enhancer or mixtures thereof.

59. A masterbatch concentrate for addition to a fiber-forming polyamide to form an acid dye stain-resistant fiber-forming polyamide, said concentrate comprising a reagent and a carrier therefor wherein said reagent has the formula:



wherein: Q and Z are moieties which associate with free acid dye sites in said polyamide;

a is an integer from 0 to 2;

b is an integer from 1 to 4; and

R is selected from the group consisting of aliphatic, aromatic or alicyclic hydrocarbyl groups; and

said carrier is selected from the group consisting of:

(A) a terpolymer comprising from about 56% to about 94.5% by weight of at least one alpha-monoolefin having 2 to 8 carbon atoms, about 5% to about 40% by weight of an ethylene-α,ß unsaturated carboxylic acid (1) C_1-C_4 alkyl or (2) glycidyl ester and from about 0.5% to about 4.0% by weight of an internal anhydride of an ethylenically unsaturated carboxylic acid;

(B) a semi-crystalline thermoplastic polyester having a melting point of about 235°C or less;

(C) a semi-crystalline thermoplastic polyamide with a melting point of about 235°C or less; and

(D) mixtures thereof.

60. The concentrate of claim 59 wherein said masterbatch concentrate comprises from about 20% to about 80% by weight of said reagent.

61. The concentrate of claim 60 wherein at least one of said Q and Z is a carboxylic acid group or a salt thereof.

62. The concentrate of claim 60 wherein at least one of said Q and Z is an isocyanate group.

63. The concentrate of claim 60 wherein at least two of said Q and Z combine to form a carboxylic acid anhydride.

64. The concentrate of claim 60 wherein said reagent is 5-sulfoisophthalic acid or a salt thereof.

65. The concentrate of claim 64 wherein said reagent is an alkali metal, alkaline earth metal or transition metal salt of 5-sulfoisophthalic acid.

66. The concentrate of claim 65 wherein said reagent is the lithium salt of 5-sulfoisophthalic acid.

67. The concentrate of claim 65 wherein said reagent is the sodium salt of 5-sulfoisophthalic acid.

68. The concentrate of claim 65 wherein said reagent is 3-sulfobenzoic acid or the sodium or lithium salt thereof.

69. The concentrate of claim 59 wherein, in (A), said alpha-monoolefin is ethylene.

70. The concentrate of claim 59 wherein, in (A), said ethylene-α,β unsaturated acid is acrylic acid, methacrylic acid or mixtures thereof.

71. The concentrate of claim 59 wherein, in (A), said internal anhydride of an ethylenically unsaturated acid is maleic anhydride.

72. The concentrate of claim 59 wherein, in (B), said alpha-monoolefin is ethylene.

73. An acid dye stain-resistant fiber or fibers formed from the composition of claim 31.

74. An article of manufacture prepared with the fiber or fibers of claim 73.

75. A textile article according to claim 74.

76. A carpet according to claim 75.